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horizontal. Had the locomotive and tender been running at the rate of  $r=60$  miles an hour, how many tons would the pressure on the bridge have been?

\*\*\* Solutions of these problems should be sent to B. F. Finkel not later than April 10.

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### AVERAGE AND PROBABILITY.

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91. Proposed by G. B. M. ZERR, A. M., Ph. D., Professor of Mathematics and Science, Chester High School, Chester, Pa.

Six points  $A, B, C, D, E, F$  are taken at random on the surface of a sphere. Find the chance that the plane through  $A, B, C$  intersects the plane through  $D, E, F$  within the sphere.

92. Proposed by F. P. MATZ, M. Sc., Ph. D., Professor of Mathematics and Astronomy in Irving College, Mechanicsburg, Pa.

A circular field, radius  $r$ , is divided into four *equal* parts, by concentric circles and three concentric rings. From the center of this field are fired *at random*, and with such a velocity as not to produce a range greater than the radius of the field,  $m=1000$  projectiles of the *same* kind. How many projectiles should have fallen into each one of these four equal parts of the field?

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## EDITORIALS.

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Mr. W. D. Cairns has been appointed to an instructorship in mathematics in Oberlin College.

A fac-simile reprint of Legendre's *Theorie des Numbers* has lately been issued by A. Hermann, of Paris.

Among the lecturers before the students of the College for Women of the Western Reserve University, is Prof. E. S. Loomis, Teacher of Mathematics in the West High School of Cleveland, Ohio. Prof. Loomis's lectures are on *Fundamentals in the Teaching of Arithmetic, and Essentials in Teaching Algebra*.

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## BOOKS AND PERIODICALS.

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*Elements of Precise Surveying and Geodesy.* By Mansfield Merriman, Professor of Civil Engineering in Lehigh University. 8vo. Cloth, 261 pages. Price, \$2.50. New York: John Wiley & Sons.

The work begins with an elementary treatment of the method of least squares, developing the theory of the method in such an elegant and lucid way as to be clearly comprehended by a beginner. Many examples are solved to illustrate the various principles as they are developed. One not familiar with the Law of Probability of Error, and the Method of Least Squares and desiring to get a working knowledge of the subject needs this book. Chapter II treats of Precise Plane Triangulation in which is applied the Method of Least Squares for the correction of measured magnitudes; Chapter III treats of Base

Lines; Chapter IV, of Leveling; Chapter V, of Astronomical Work, in which is treated the Precise Measurement of Latitude by various methods; Longitude, Azimuth, and Time; Chapter VI treats of Spherical Geodesy. This subject is introduced by a brief but very interesting history of Geodesy, beginning with the earliest times and bringing it down to the present time. Chapter VII deals with Spheriodal Geodesy; Chapter VIII, Geodetic Coördinates and Projections, including the various map-projections; Chapter IX, of Geodetic Triangle; and Chapter X, on the Figure of the Earth. This last chapter is full of interest, as the various assumed forms of the earth are discussed briefly. These various forms are the Spheriod, the Ellipsoid, the Ovaloid, and the Geoid. The book is one of the highest interest and importance not only to engineers but to mathematicians as well.

B. F. F.

*Statistical Methods with Special Reference to Biological Variation.* By C. B. Davenport, Instructor in Zoölogy in Harvard University. 16mo. Morocco, 135 pages. Price, \$1.25. New York: John Wiley & Sons.

This work is intended especially for Botanists, Zoölogists, Anthropologists, Anatomists, Physiologists, and Psychologists who are interests in the quantitative study of species and of organic variation. It will also be of service to Economists, Sociologists, Meteorologists, and practical Statisticians. It treats in simple language, and for the most part without the use of mathematics beyond the elements of algebra of the statistical methods elaborated by Galton and Pearson. The mean, mode, probable error, index of variation, the coefficients of correllation and heredity are defined and the methods of getting them explained. The treatment of curves of the different classes, normal, skew (of three types), compound, and multimodal, is made clear. The work is a complete handbook, for it contains tables of reduction from English to metric units; squares, cubes, roots, and reciprocals of numbers from 1 to 1000; six-place logarithms of numbers and circular functions; table of gamma functions, etc. The table of using each table is fully explained. There have been added also some pages of cross-section paper, a metric scale, and a protractor. The book contains 31 figures, is of pocket size, and is bound in morocco.

B. F. F.

*Transactions of the American Mathematical Society,* Edited by Drs. E. H. Moore, E. W. Brown, and T. S. Fiske. Published quarterly by the Society with the coöperation of Harvard, Yale, Princeton, Columbia, Northwestern, Cornell, The University of Chicago, Haverford College, Bryn Mawr College, and the University of California.

The first number of the first volume contains the following articles: Conics and Cubics connected with a Plane Cubic by certain Covariant Relations, by H. S. White; Formentheoretische Entwickelung der Herrn White's Abhandlung über curven dritter Ordnung enthaltenden Sätze, by P. Gordan; Sur la définition générale des fonctions analytiques, d'après Cauchy, by E. Goursat; On a Class of Particular Solutions of the Problem of Four Bodies, by F. R. Moulton; Definition of the Abelian, the Two Hypoabelian, and the Related Linear Groups as Quotient-groups of the Groups of Isomorphisms of Certain Elementary Groups, by L. E. Dickson; Note on the Unilateral Surface of Moebius, by H. Maschke; On Regular Singular Points of Linear Differential Equations of the Second Order whose Coefficients are not necessarily Analytic, by M. Bocher; The Elliptic Sigma-Functions considered as a Special Case of the Hyperelliptic Sigma-Functions, by O. Bolza; On Groups which are the Direct Products of Two Subgroups, by G. A. Miller; On Certain Crinckly Curves, by E. H. Moore; A Definition of the General Abelian Linear Group, by L. E. Dickson.

B. F. F.

*Annals of Mathematics.* Published under the Auspices of Harvard University. Issued Quarterly. Price, \$2.00 per year in advance.

The January (1900) number contains the following: On Three-Dimensional Determinants, by E. R. Hedrick; On Tide Currents in Estuaries and Rivers, by Ernest W. Brown; Note on Netto's Theory of Substitution, by Dr. G. A. Miller; A Method of Solving Determinants, by G. Macloski; The Development of Functions, by S. A. Corey; Illustrations of the Elliptic Integrals of the First Kind by a certain Link-Work, Dr. Arnold Emch; and Problems in the Theory of Continuous Groups, by Chas. L. Bouton.

B. F. F.

*Periodico di Matematica* for January and February, contains among other articles, one on the Geometric Theory of Inversion, by G. Lazzeri, and another on the Fundamental Theorem of Maxima and Minima, by Roberto Volpi.